WHAT IS CLAIMED IS:

1. A method for controlling when a transponder replies to Mode-S interrogation signals, comprising:

receiving Mode-S signal containing a P5 and P6 pulses and interference, each of said P6 pulses containing a sync phase reversal (SPR) signal followed by a data segment containing Mode-S data and interference, said P5 pulses being asynchronous with respect to said SPR signals;

identifying a potential P6 pulse;

analyzing said potential P6 pulse based on at least one of signal timing, length and phase information in said potential P6 pulse to determine whether said potential P6 pulse is a valid P6 pulse; and

replying to Mode-S signals for which said SPR signal is correctly identified.

2. The method of claim 1, further comprising comparing said at least one of signal timing, length and phase information in said potential P6 pulse with predetermined values, said predetermined values being set such that valid P6 pulses are identified correctly in at least 99% of said received Mode-S signals in which said amplitude of said P6 pulse is at least 12 dB greater than said amplitude of said P5 pulse and in no more than 2% of the received Mode-S signals in which the amplitude of the P6 pulse is at least 3 dB less than the amplitude of the P5 pulse.

3. The method of claim 1, further comprising comparing said at least one of signal timing, length and phase information in said potential P6 pulse with predetermined values, said predetermined values being set such that valid P6 pulses are identified correctly in at least 95% of said received Mode-S signals in which said amplitude of said P6 pulse is at least 6 dB greater than said amplitude of said interference.

4. The method of claim 1, further comprising comparing said at least one of signal timing, length and phase information in said potential P6 pulse with predetermined values, said predetermined values being set such that valid P6 pulses are identified correctly in at least 65% of said received Mode-S signals in which said amplitude of said P6 pulse is at least 3 dB greater than said amplitude of said interference.

5. The method of claim 1, wherein said analyzing step includes determining whether said potential P6 pulse changes state within an SPR acceptance window of time following a leading edge of said potential P6 pulse.

6. The method of claim 1, wherein said analyzing step includes determining whether said potential P6 pulse changes state from a first state to a second state and remains at said second state for at least a minimum time period.

7. The method of claim 1, further comprising analyzing a potential SPR signal in said potential P6 pulse based on at least one of a timing, length and phase of said SPR signal to determine whether said potential P6 pulse is a valid P6 pulse.

8. The method of claim 1, further comprising comparing at least one of timing, length and phase of an SPR signal in said potential P6 pulse with predetermined values, said predetermined values being set such that valid P6 pulses are correctly identified at least 99% of said received Mode-S signals in which said amplitude of said P6 pulse is at least 12 dB greater than said amplitude of said P5 pulse and in no more than 2% of the received Mode-S signals in which the amplitude of the P6 pulse is at least 3 dB less than the amplitude of the P5 pulse.

9. The method of claim 1, further comprising comparing at least one of timing, length and phase of an SPR signal in said potential P6 pulse with predetermined values, said predetermined values being set such that valid P6 pulses are correctly identified in at least 95% of said received Mode-S signals in which said amplitude of said P6 pulse is at least 6 dB greater than said amplitude of said interference.

10. The method of claim 1, further comprising comparing at least one of timing, length and phase of an SPR signal in said potential P6 pulse with predetermined values, said predetermined values being set such that valid P6 pulses are correctly identified in at least 65% of said received Mode-S signals in which said amplitude of said P6 pulse is at least 3 dB greater than said amplitude of said interference.

11. The method of claim 1, further comprising validating a potential SPR signal in said potential P6 pulse.